The First Law of Inward Physics — Methods & Constants Addendum (2025)

Author: Daniel Jacob Read IV

Affiliation: ĀRU Intelligence Inc.

Date: October 2025

License: CC BY-NC-ND 4.0 International

1. Constants and Dimensional Definitions

Memory Field: $\mu(x, t)$ is a dimensionless scalar representing normalized memory density, defined by $\mu(x, t) = 1 - \Phi(x, t)/c^2$, where Φ is the Newtonian gravitational potential and c is the speed of light.

Mass Constant (κ): Units $kg \cdot m^{-3}$. Calibrated so that $M = \kappa \int \mu(x, t)\, d^3x$ reproduces known mass.

Gravity Constant (κ_g): $\kappa_g = -c^2$. Thus $g(x, t) = -\kappa_g \nabla \mu(x, t) = -\nabla \Phi(x, t)$, recovering Newtonian gravity.

Time Constant (κ_t): $\kappa_t = 1$, giving $d\tau/dt = 1/\mu(x, t) \approx 1 + \Phi(x, t)/c^2$ in weak fields.

2. Dynamical Model of the Memory Field

The field evolves as $\partial \mu / \partial t = D \nabla^2 \mu - \lambda(\mu - 1) + S(x, t)$, where D is the diffusion coefficient, λ the relaxation rate, and S(x, t) the reinforcement source representing observation or structural memory.

3. Experimental Program

Experiment A — Gravitational Response to Memory Modulation:

Objective: Detect correlated changes in local acceleration g during controlled modulation of the memory field.

Setup: A gravimeter or atom interferometer near a shielded MRAM-based information reservoir enclosed in μ-metal and Faraday shielding. Environmental sensors record EM, thermal, and vibrational noise.

Drive: Alternating bit-erasure and write patterns generate static $\nabla \mu$ gradients under randomized orientations.

Prediction: δg correlated with drive flips, uncorrelated with environmental effects.

Experiment B — Time-Rate Drift under Memory Saturation:

Setup: Two identical, fully stabilized atomic clocks—one near the active reservoir, one control.

Drive: Randomized on/off cycles of memory activity without electromagnetic leakage.

Prediction: Phase drift within the high-μ region, consistent with $d\tau/dt = 1/\mu(x, t)$.

4. Statistical and Reproducibility Protocols

• Pre-register all tests on the Open Science Framework.

• Employ triple-blind analysis and independent data verification.

• Define positive result as Bayes factor > 3.

• Require at least two independent replications.

• Publish all results, including null findings, for transparent falsifiability.

5. Expected Results and Classical Recovery

Gravity: $g = -\kappa_g \nabla \mu = -\nabla \Phi$ (Newtonian gravity)

Time Dilation: $d\tau/dt = 1/\mu \approx 1 + \Phi/c^2$ (weak-field GR)

Mass Conservation: $M = \kappa \int \mu \, d^3x \rightarrow \kappa V$ (rest mass constant)

These relations confirm that the memory-field framework reproduces classical limits when $S(x, t) \rightarrow 0$.

6. Summary

This addendum defines the constants, field dynamics, and experimental pathway for the First Law of Inward Physics. The scalar field $\mu(x, t)$ acts as a unifying memory-density metric linking mass, gravity, and time. Modulating $S(x, t)$ allows direct falsifiability. A successful outcome would indicate a memory-based origin for gravitational and temporal structures, providing the first empirical bridge between consciousness, memory, and spacetime mechanics.